Teaching East Asia with GIS

By Tanya L. Roth

Twenty years ago, taking a trip meant gathering the right maps or tracing the itinerary in an atlas. In the classroom, maps have long gone hand in hand with studying history: globes, wall-mounted maps, projected maps—these static images also help students in their journey to understand how events unfold across time and space. Maps are important visual reference points: with them, students can see where history happened and better understand why; for example, maps showing the earliest construction of the Great Wall of China allow students to explore questions about the placement of the wall and its construction. But maps are just the beginning: this essay offers resources and information about using interactive maps—geographic information systems (GIS)—to teach East Asia.

While static images showing physical or political geography are important and always have been, today we use dynamic, interactive maps every day that help us make sense of the world around us in new ways. With a few taps, we can find the quickest route anywhere, using real-time data fed into apps like Waze or Google Maps. GasBuddy lets users find the cheapest gas in any given area, while Yelp offers a selection of restaurants or other businesses close to where users are. On any given day, many of us use maps that are a far cry from the basic paper atlas that used to live in the car to help find the right roads between point A and point B. Today's maps are robust GIS—maps that combine endless types of data to help us better understand our world.

The Emergence of GIS

There is nothing particularly new about GIS; even two-dimensional maps make use of multiple layers of data, such as roads, boundaries, and physical features. In the 1850s, English physician John Snow became the first person to successfully trace the source of a cholera epidemic to a neighborhood well. His work not only marked significant advancement in epidemiology, but also created one of the early examples of GIS in action. Snow mapped the location of cholera outbreaks in a certain neighborhood, then noticed that the affected households used the same water pump. His work helped scientists determine that cholera is a waterborne disease, and Snow's map remains a significant example of how layers of data (locations of cholera patients, common water sources) combined with geography can help solve important issues.[1]

Computers and the internet have made it possible to create dynamic geographic representations, pulling data from live sources (apps such as Google Maps or Waze) on anything imaginable. Maps no longer have to be static; with the right tools, users can click layers on and off to show specific types of information that allow them to investigate any given topic. Today, businesses, organizations, and governments around the world are using GIS to address a variety of things, such as handling the opioid crisis, modeling wildfire trajectories, and managing day-to-day tasks in the power industry; visit http://www.esri.com/esri-news to learn more about current projects around the world.

GIS tools are used today in many industries and by local governments; it's also not uncommon to see GIS in STEM classrooms. However, historians have been using GIS tools for many years to perform historical analysis, uncover patterns, and ask new questions about the past. Harvard's *China Historical* GIS site (included in the next section, "Applications for Teaching East Asia") offers interactive tools for exploring Chinese history. Stanford's Spatial History Project, while not specific to Asia, also highlights the ways historians are using data and maps to explore history in new ways through physical space.

Applications for Teaching East Asia

For those teaching Asian history, there are several existing resources that make it possible to integrate GIS with premade items such as GeoInquiries and Story Maps. Teachers who want to create their own materials can find online educational materials to learn how to build their own maps. Additionally, teaching students how to build their own maps is very manageable with the right planning.

If you are new to GIS, it's OK to start small; preexisting materials offer the most user-friendly ways to integrate GIS if you have never used it before. These are great starting points to integrate GIS successfully. Links for resources described in this essay are available in the endnotes.

Story Maps combine maps, images, and other multimedia to create geographically based narratives. ESRI, the developer behind ArcGIS (the most well-known GIS software), offers a gallery of Story Maps from various sources. Story Maps are excellent to use with students because they provide a guided exploration of a topic. They can be great introductions to the idea of using space and place to better understand East Asia and its history.

In "The Two Koreas," users read about the history of the divide between North and South Korea.[2] This Story Map uses images, graphs, a timeline, and dynamic maps of Korea to explain how these two countries became what they are today and how they differ from one another.

"Exploring China's Burgeoning Highways," is more specific and less history-oriented, but offers a good example of how many Story Maps use ArcGIS online to plot information points (see opening image in the story).[3] In this Story Map, users learn more about the recent growth of China's highway system and see satellite imagery of specific areas.

The China "Ghost Towns" map likewise offers a glimpse into more recent issues in China.[4] On this Story Map, users can see where the housing bubble has left empty housing developments and districts.

The Story Map "An Infamous Day" traces the bombing of Pearl Harbor, providing details of the Japanese crews and their journey, the three waves of the bombing, and the aftermath.[5] This map highlights how historical video and images combine with maps to tell this story in a new way.

For several years, Paul Salopek of the National Geographic Society has been retracing the Silk Road across Asia. His Story Map "On Foot in the Path of the Silk Road" traces this experience.[6]

For students who have only ever read about or seen a map of the Silk Road, Salopek's photographs and videos offer a new way to understand the challenges of trade over the Silk Road. While much of his Story Map focuses on Central Asia, he connects the ancient Silk Road with its related routes and with trade and globalization today, including China's Belt and Road Initiative.

All these Story Maps are good initial entry points for exploring GIS in the classroom. Students might explore these Story Maps as homework, or in small groups or pairs in a classroom.

To dive deeper, move into GeoInquiries, which provide fifteen-minute guided explorations with students. Although GeoInquiries are designed to be led by a teacher on a projected screen, it is also possible to let students move through GeoInquiries on their own or in pairs. GeoInquiries are a wonderful teaching tool because they offer hands-on analytical

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Main page of the "China 'Ghost Towns'" map. Source: *ESRI ArcGIS Story Maps* at http://arcg.is/0SWaqO.

engagement: with these activities, students don't just view the map and read the information—they analyze and look for patterns. For a full list of GeoInquiries arranged by subject area, visit https://tinyurl.com/y8bq9j6s.

To use the GeoInquiries below, visit the link provided, then click to view the PDF thumbnail. The PDF file contains all the details needed for the GeoInquiry. Each is designed as if a teacher is asking the questions of their students. Navigate to the map URL provided in the GeoInquiry PDF, then follow the directions. Be sure to test out all GeoInquiries on your own before using them with students so that you feel comfortable taking them through the activity.

If you prefer to have students work through the activities in pairs or on their own, print the PDF to Microsoft Word to edit the GeoInquiry; this will allow you to add questions, remove the answer key, or insert any other information you want students to know.

These three GeoInquiries in particular would work well in East Asian history:
- "Hiroshima" (in the American literature GeoInquiry collection, based on the John Hersey book)[7]
- "Silk Roads: Then and Now"[8]
- "Trade and the Black Death"[9]

GeoInquiries and Story Maps are good resources to start exploring GIS in the classroom. To dig deeper, there are other resources that can be used with students or to teach yourself more about using GIS tools.

For example, Harvard's "China Historical" GIS site allows users to click layers on and off, similar to using the ArcGIS online map viewer.[10] This map includes layers such as a heat map of where Qing, Ming, and Song civil service entry exams were taken. Because heat maps use color to show data, often using darker colors to indicate the highest concentration of the data, viewing these is an interesting way to consider where government resided in these dynasties; the color illustrates the number of examinees in different areas of China. Other layers provide information such as postal or courier routes from various dynasties.

On the same site, the "ChinaX" map provides additional data at https://worldmap.harvard.edu/maps/chinaX. This map provides other details about the Song, Ming, and Qing dynasties, as well as some limited information about the Republic of China, including the Northern Expedition (1926–1927), a short-lived alliance between the Chinese Nationalist Army and the Chinese Communists that disintegrated once the goal of eliminating warlords had been achieved.

After becoming comfortable with sites such as these, learning to use ArcGIS Online may become easier. ArcGIS Online allows users to create their own maps, using data of their own or data sourced from the Living Atlas or other user-generated layers. ESRI provides free ArcGIS Online accounts to schools, as well as some training materials.

Such training makes it possible to create simple maps that show the sites of American firebombing campaigns over Japan prior to the bombings of Hiroshima and Nagasaki.[11] This map was created with an Excel spreadsheet of information such as city names, latitude and longitude, and descriptions, then imported into ArcGIS Online's Map Viewer. Use the layer feature (the icon that looks like several sheets stacked onto one another) to turn layers on and off. It is possible to click on any location to learn more about the city and the destruction sustained during the American firebombing raids.

Ultimately, teachers can take GIS as far as they want when teaching East Asian history. In just fifteen minutes, GeoInquiries help teachers prompt students to explore and think about the role of geography in East Asian history in new ways. For those teachers who want to do more and create their own materials, it does not take much to learn how to find data, create layers, and develop activities of their own. With a little knowledge, any lesson can become fodder for deeper analysis with GIS. For example, MIT's "Visualizing Cultures: Rise and Fall of the Canton Trade System" lessons would translate well as GeoInquiries or interactive map apps like the "Japan Firebombing" or "China Historical" GIS maps.[12] Whether you prefer premade activities or are ready to build your own, incorporating GIS into your East Asian history class is a useful way to help students visualize the past in new ways. ∎

NOTES

1. "Mapping the 1854 Broad Street Pump Outbreak," University of California–Los Angeles (UCLA) Department of Epidemiology, accessed November 2, 2018, https://tinyurl.com/y7dxdl5w.
2. "The Two Koreas," *ESRI ArcGIS Story Maps*, accessed November 2, 2018, https://arcg.is/0yGri0.
3. "Exploring China's Burgeoning Highways," *ESRI ArcGIS Story Maps*, accessed November 2, 2018, https://arcg.is/1zzuiG.
4. "China 'Ghost Towns,'" *ESRI ArcGIS Story Maps*, accessed November 2, 2018, http://arcg.is/0SWaqO.
5. "An Infamous Day," *ESRI ArcGIS Story Maps*, accessed November 2, 2018, http://bit.ly/2bGeEf7.
6. "On Foot in the Path of the Silk Road," *ESRI ArcGIS Story Maps*, accessed November 2, 2018, https://arcg.is/1KHD1X.
7. "Hiroshima: Geoinquiries Collection," *ESRI ArcGIS,* accessed November 2, 2018, http://arcg.is/100y5O.
8. "Silk Roads: Geoinquiries Collection," *ESRI ArcGIS,* accessed November 2, 2018, http://arcg.is/1PjyiG.
9. "Trade and the Black Death: Geoinquiries Collection," *ESRI ArcGIS,* accessed November 2, 2018, http://arcg.is/nniOf.
10. "China's History in Maps," *Harvard's World Map*, accessed November 2, 2018, https://tinyurl.com/y9fsavjb.
11. "Roth Firebombing V2," *ESRI ArcGIS Maps,* accessed November 2, 2018, http://arcg.is/1PzK8m.
12. "A Tale of Two Cities: The China Trade in Canton & Hong Kong," *MIT Visualizing Cultures,* accessed November 2, 2018, https://tinyurl.com/y8rw3zs7.

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